AMENDMENTS TO THE CLAIMS

1. (currently amended) A method comprising disaggregating asphaltenes in a petroleum oil and mixtures of petroleum oils, feedstream and/or refinery process streams by mild heating of said petroleum oils and mixtures of petroleum oils, feedstream and/or refinery process streams, the disaggregated asphaltenes remaining soluble in the petroleum oil and mixtures of petroleum oils feedstream and/or refinery process streams wherein said heating is performed at a temperature between 40°C and 150°C for a time period of 1 minute to four weeks.

2. (previously presented) The method of claim 1 further comprising the step of determining the presence of asphaltene aggregates by irradiating said petroleum oils and oil mixtures of petroleum oils, feedstream and/or refinery process streams with neutrons and determining small angle neutron scattering (SANS) intensity, I, as a function of wavenumber, q, wherein said scattering intensity includes a coherent component and an incoherent component.

3. (previously presented) The method of claim 2 wherein said neutron scattering wavenumber, q, is in the range 10^{-4} Å$^{-1} \leq q \leq 1$ Å^{-1}.

4. (previously presented) The method of claim 3 wherein compatibility and incompatibility of petroleum oils and mixtures of petroleum oils and/or refinery process streams are determined fitting $I(q)$ to an equation based on a physical model that contains coherent components, a strongly decaying component to describe the surface scattering of asphaltene aggregates at the q near its lower range (low-q), a plateau component with a falloff for q near its upper range (high-q) to describe the asphaltene particles, and a constant to describe the q incoherent component.

5. (previously presented) The method of claim 4 wherein the equation is given by

$$I(q) = I_{\text{incoh}} + I_{\text{L}} / \left(1 + q^2 \xi^2\right) + I_{\text{surf}} \left(q / q_1\right)^{-\alpha}$$

Wherein, I_{incoh} is the constant high-q incoherent scattered neutron intensity, I_{L} is the low-q plateau intensity of the Lorentzian (second term), ξ is the correlation length (proportional to the radius of gyration of an asphaltene particle), I_{surf} is the low-q value of the intensity due to surface scattering from asphaltene aggregates, α is the absolute value of the logarithmic slope of $I(q)$ at low q, and q_1 is fixed by the lowest q in the range.

6. (previously presented) The method of claim 5 wherein incompatibility is determined by the concavity of the low-q plateau intensity of the asphaltene particles, I_{L}, as a function of the volume fraction of mixing, ϕ_{m}.

7. (previously presented) The method of claim 5 wherein incompatibility is determined by the systematic deviation of I_{L}, as a function of mixing volume fraction from a hard sphere prediction.

8. (previously presented) The method of claim 5 wherein incompatibility is determined by a maximum in the correlation length, ξ.

9. (previously presented) The method of claim 5 wherein incompatibility is determined by the dominance of the low-q value of the surface scattering intensity, I_{surf}, over the sum of the low-q plateau intensity of the asphaltene particles, I_{L}, and the incoherent scattering intensity, I_{incoh}.

10. (previously presented) The method of claim 5 wherein incompatibility is determined by the power law exponent, α, exceeding a value of three.

11. (previously presented) A method to estimate the volume fraction of asphaltene aggregates, ϕ_{agg}, in incompatible petroleum oil and/or refinery process stream mixtures comprising determining the difference between I_L, the low-q plateau intensity corresponding to the asphaltene particles and I_{HS}, the intensity perfect hard spheres in the absence of aggregation, wherein I_L, and I_{HS} are are determined at different volume fractions of mixing ϕ_m.

12. (previously presented) The method of claim 11 wherein the equation to estimate the volume fraction of asphaltene aggregates, ϕ_{agg}, is given by the difference between the measured valve of I_L (ϕ_m) and the I_L (ϕ_m) for perfect hard spheres in the absence of aggregation.

13. (previously presented) The method of claim 5 wherein the total surface area of asphaltene aggregates per unit volume of the petroleum oil, S_V, is determined from the surface scattering intensity, I_{surf}, at low wavenumbers, q.

14. (previously presented) The method of claim 12 wherein the average length scale, R, associated with the internal structures of the asphaltene aggregates is determined from the ratio of the volume fraction of asphaltene aggregates and the total surface area of asphaltene aggregates, wherein the total surface of asphaltene aggregates per unit volume of the petroleum oil, S_V, is determined from the surface scattering intensity, I_{surf} at low wavenumbers, q.

15. (previously presented) The method of claim 2 wherein said neutron scattering wavenumber, q, is in the range 10^{-3} Å^{-1} $\leq q \leq 10^{-1}$ Å^{-1}.

16. (cancelled)

17. (previously presented) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 100°C for a time period of 2 minutes to 24 hours.

18. (previously presented) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 80°C for a time period of 3 minutes to 3 hours.

19. (previously presented) The method of claim 1 wherein said heating is performed at a temperature range between 40°C and 60°C for a time period of 4 minutes to 1 hour.